**Remarks**

Amendment to claim 1

Claim 1 is amended to more clearly specify the claimed subject matter and to depend on the newly added independent claim 2. New claims 2 and 3 are added. Support for the amendment to claim 1 and new claim 2-3 is found in the original claim 1 as filed and at p. 5, lines 25-28; p. 10, line 19 to p.13, line 9 of the specification.

Restriction requirement

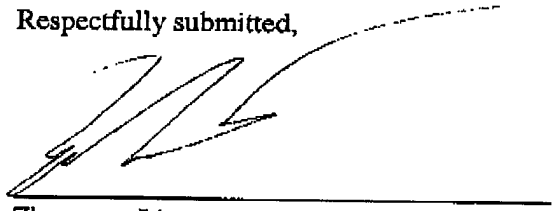
Claim 1 was subjected to restriction requirement. The Examiner required claim 1 to be restricted to one of the groups of probes defined in claim 1, namely, the DNA probes for β-thalassemia ((SEQ ID NO:1 to SEQ ID NO:52), the DNA probes for α-thalassemia, HbH, HbS and HbM hemoglobin abnormality Constant Spring mutation (SEQ ID NO:53 to SEQ ID NO:54), the DNA probes for Quong SZE mutation (SEQ ID NO:55 to SEQ ID NO:56), the DNA probes for HbS sickle cell anemia mutation (SEQ ID NO:57 to SEQ ID NO:58), the DNA probes for Duan mutation (SEQ ID NO:59 to SEQ ID NO:60), the DNA probes for HbM mutation (SEQ ID NO:61 to SEQ ID NO:70). The applicant elects the group of DNA probes for β-thalassemia (SEQ ID NO:1 to SEQ ID NO:52) for examination with traverse.

Claim 1, and new claims 2 and 3 are drawn to a gene chip, having a variety of groups of DNA probes which are all related to hereditary anemia related gene mutations. The groups of probes are species falling within the scope of the new independent claim 2. The DNA probes for β-thalassemia (SEQ ID NO:1 to SEQ ID NO:52) just define a species of gene chip within the genus of the gene chip defined in claim 2, the genus being a gene chip for diagnosing the mutation of the hereditary anemia related genes.

An election of species requirement applies when a generic claim is drawn to a plurality of species (MPEP § 808). A restriction requirement, in contrast, requires a set of claims to be restricted into two ore more groups of claims, each of which defines a patentably distinct subject matter (see MPEP § 803). As discussed above, the specific gene chip having fixed thereon a group of DNA the probes defined therein is just a species of the generic gene chip defined in claim 2. The restriction requirement is therefore an election of species requirement rather than a restriction requirement.

Allowance of claim 1 and new claims 2-3 is earnestly solicited.

Respectfully submitted,



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Dated: April 23, 2003

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**U.S.S.N.:09/912,673**
**Filed: July 23, 2001**
**AMENDMENT AND RESPONSE TO RESTRICTION REQUIREMENT**

## CERTIFICATE OF FACSIMILE TRANSMISSION

I hereby certify that the enclosed Response to Office Action and all documents shown as being attached is being facsimile transmitted to the U. S. Patent and Trademark Office on the date shown below.

Date: April 23, 2003

Peggy D. Bailey
Peggy Bailey

**Appendix I: Marked-up copy of amended claims**

1. (amended) [A kind of] The DNA chip of claim 3 [for diagnosing the mutation of the hereditary anemia related genes, wherein fixed specific DNA probes for testing the above-said mutation on the glass slide, silica plate, membrane and macromolecular materials. The said probes are as follows], wherein the DNA probes for β-thalassemia comprise:

| | |
|---|---|
| β (27-28) 1 | TGG TGA GGC CCT GGG CAG (SEQ ID NO:1) |
| β (27-28) 2 | GGT GAG GCC CCT GGG CAG (SEQ ID NO: 2) |
| β (43 ) 1 | GGT TCT TTG AGT CCT TT (SEQ ID NO:3) |
| β (43) 2 | GGT TCT TTT AGT CCT TT (SEQ ID NO:4) |
| β (42+T) 2 | AGG TTC TTT TGA GTC CT (SEQ ID NO:5) |
| IVS (2-1) 1 | CTT CAG GGT GAG TCT (SEQ ID NO:6) |
| IVS (2-1) 2 | CTT CAG GAT GAG TCT (SEQ ID NO:7) |
| β (1) 1 | ACA GAC ACC ATG GTG CAC CT (SEQ ID NO:8) |
| β (1) 2 | ACA GAC ACC AGG GTG CAC CT(SEQ ID NO:9) |
| β (8) 1 | GAG GAG AAG TCT GCC (SEQ ID NO:10) |
| β (8) 2 | TGA GGA GGT CTG CCG (SEQ ID NO:11) |
| β (8-9) 2 | AGG AGA AGG TCT GCC (SEQ ID NO:12) |
| β (37) 1 | TAC CCT TGG ACC CAG (SEQ ID NO:13) |
| β (37) 2 | TAC CCT TAG ACC CAG (SEQ ID NO:14) |
| P (+40-43) 1 | GCA ACC TCA AAC AGA CA (SEQ ID NO:15) |
| P (+40-43) 2 | AGC AAC CTC AGA CAC CA (SEQ ID NO:16) |

| | |
|---|---|
| P (β31, IVS1) 1 | CAC CCT TAG GCT GCT GG (SEQ ID NO:17 ) |
| P (IVS1) 2 | CCC ACC CTG AGG CTG CT (SEQ ID NO: 18) |
| β (31) 2 | CCC TTA GGT GCT GGT GG (SEQ ID NO:19) |
| P (cap+1) 1 | ATT GCT TAC ATT TGC (SEQ ID NO:20 ) |
| P (cap+1) 2 | ATT GCT TCC ATT TGC (SEQ ID NO:21 ) |
| β (19) 1 | AAG GTG AAC GTG GAT (SEQ ID NO:22) |
| β (19) 2 | AAG GTG AGC GTG GAT (SEQ ID NO:23) |
| β (95+A) 1 | CTG TGA CAA GCT GCA (SEQ ID NO:24) |
| β (95+A) 2 | TGT GAC AAA GCT GCA (SEQ ID NO:25) |
| IVS (2-5) 1 | AGG GTG AGT CTA TGG (SEQ ID NO:26) |
| IVS (2-5) 2 | AGG GTG ACT CTA TGG (SEQ ID NO:27) |
| β (41-42) 1 | CAG AGG TTC TTT GAG T (SEQ ID NO:28) |
| β (41-42) 2 | CAG AGG TTG AGT CCT T (SEQ ID NO:29) |
| IVS (2-654) 1 | GTT AAG GCA ATA GCA (SEQ ID NO:30) |
| IVS (2-654) 2 | GTT AAG GTA ATA GCA (SEQ ID NO:31) |
| β (17) 1 | CTG TGG GGC AAG GTG AAC (SEQ ID NO:32) |
| β (17) 2 | CTG TGG GGC TAG GTG AAC (SEQ ID NO:33) |
| β (71-72) 1 | TGC CTT TAG TGA TGG (SEQ ID NO:34) |
| β (71-72) 2 | TGC CTT TAA GTG ATG (SEQ ID NO:35) |
| β (71-72) 3 | TGC CTT TTA GTG ATG (SEQ ID NO:36) |
| IVS (1-5) 1 | CAG GTT GGT ATC AAG (SEQ ID NO:37) |
| IVS (1-5) 2 | CAG GTT GCT ATC AAG (SEQ ID NO:38) |

| | |
|---|---|
| IVS (1-1) 1 | TGG GCA GGT TGG TAT (SEQ ID NO:39) |
| IVS (1-1) 2 | TGG GCA GTT TGG TAT (SEQ ID NO:40) |
| β (30) 2 | CTG GGC GGG TTG GTA (SEQ ID NO:41) |
| P (-28) 1 | GGG CAT AAG AGT CAG (SEQ ID NO:42) |
| P (-28) 2 | GGG CAT AGG AGT CAG (SEQ ID NO:43) |
| P (-29) 2 | TGG GCA TGG AAG TCA (SEQ ID NO:44) |
| P (-30) 1 | CTG GGC ATA AAA GTC (SEQ ID NO:45) |
| P (-30) 2 | CTG GGC ACA AAA GTC (SEQ ID NO:46) |
| P (-31) 2 | GCT GGG CGT AAA AGT (SEQ ID NO:47) |
| P (-32) 2 | GGC TGG GAA TAA AAG (SEQ ID NO:48) |
| β (14-15) 1 | TAC TGC CCT GTG GGG CAA GG (SEQ ID NO:49) |
| β (14-15) 2 | TAC TGC CCT GGT GGG GCA AG (SEQ ID NO:50) |
| HbE (26) 1 | TGG TGG TGA GGC CCT (SEQ ID NO:51) |
| HbE (26) 2 | TGG TGG TAA GGC CCT (SEQ ID NO:52) |

wherein the DNA probes for α-thalassemia, HbH, HbS and HbM hemoglobin abnormality Constant Spring mutation comprise:

| | |
|---|---|
| P(cs) 1 | ATA CCG TTA AGG TGG (SEQ ID NO:53) |
| P (cs) 2 | ATA CCG TCA AGC TGG (SEQ ID NO:54) |

wherein the DNA probes for Quong SZE mutation comprise:

| | |
|---|---|
| P (qs) 1 | GCC TCC CTG GAC AAG (SEQ ID NO:55) |
| P (qs) 2 | GCC TCC CCG GAC AAG (SEQ ID NO:56) |

wherein the DNA probes for HbS sickle cell anemia mutation comprise:

| | |
|---|---|
| P (hbs) 1 | ACT CCT GAG GAG AAG (SEQ ID NO:57) |

P (hbs) 2 ACT CCT GTG GAG AAG (SEQ ID NO:58)

wherein the DNA probes for Duan mutation comprise:

P (duan)1 GTG GAC GAC ATG CCC (SEQ ID NO:59)

P (duan)2 GTG GAC GCC ATG CCC (SEQ ID NO:60)

and wherein the DNA probes for HbM mutation comprise:

P (hbm) 1 TAA GGG CCA CGG CAA (SEQ ID NO:61)

P (hbm) 2 TAA GGG CTA CGG CAA (SEQ ID NO:62)

P (hbm) 3 CGA CCT GCA CGC GCA (SEQ ID NO:63)

P (hbm) 4 CGA CCT GTA CGC GCA (SEQ ID NO:64)

P (hbm) 5 AAG AAA GTG CTC GGT (SEQ ID NO:65)

P (hbm) 6 AAG AAA GAG CTC GGT (SEQ ID NO:66)

P (hbm) 7 TGA GCT GCA CTG TGA (SEQ ID NO:67)

P (hbm) 8 TGA GCT GTA CTG TGA (SEQ ID NO:68)

P (hbm) 9 GAA GGC TCA TGG CAA (SEQ ID NO:69)

P (hbm) 10 GAA GGC TTA TGG CAA (SEQ ID NO:70)

Please add new claims 2-3

2. (new) A DNA chip for diagnosing the mutation of the hereditary anemia related genes having thereon fixed specific DNA probes for testing the above-said mutation on the glass slide, silica plate, membrane and macromolecular materials.

3. (new) The DNA chip of claim 2 wherein the fixed specific DNA probes are selected from the group consisting of

DNA probes for β-thalassemia;

DNA probes for α-thalassemia, HbH, HbS and HbM hemoglobin abnormality Constant Spring mutation;

DNA probes for Quong SZE mutation;

DNA probes for HbS Sickel Cell Anemia mutation;

DNA probes fro Duan mutaion;

DNA probes for HbM mutation, and

combinations thereof.

**Appendix II: Clean copy of amended claims**

1. (amended) The DNA chip of claim 3, wherein the DNA probes for β-thalassemia comprise:

| | |
|---|---|
| β (27-28) 1 | TGG TGA GGC CCT GGG CAG (SEQ ID NO:1) |
| β (27-28) 2 | GGT GAG GCC CCT GGG CAG (SEQ ID NO: 2) |
| β (43 ) 1 | GGT TCT TTG AGT CCT TT (SEQ ID NO:3) |
| β (43) 2 | GGT TCT TTT AGT CCT TT (SEQ ID NO:4) |
| β (42+T) 2 | AGG TTC TTT TGA GTC CT (SEQ ID NO:5) |
| IVS (2-1) 1 | CTT CAG GGT GAG TCT (SEQ ID NO:6) |
| IVS (2-1) 2 | CTT CAG GAT GAG TCT (SEQ ID NO:7) |
| β (1) 1 | ACA GAC ACC ATG GTG CAC CT (SEQ ID NO:8) |
| β (1) 2 | ACA GAC ACC AGG GTG CAC CT(SEQ ID NO:9) |
| β (8) 1 | GAG GAG AAG TCT GCC (SEQ ID NO:10) |
| β (8) 2 | TGA GGA GGT CTG CCG (SEQ ID NO:11) |
| β (8-9) 2 | AGG AGA AGG TCT GCC (SEQ ID NO:12) |
| β (37) 1 | TAC CCT TGG ACC CAG (SEQ ID NO:13) |
| β (37) 2 | TAC CCT TAG ACC CAG (SEQ ID NO:14) |
| P (+40-43) 1 | GCA ACC TCA AAC AGA CA (SEQ ID NO:15) |
| P (+40-43) 2 | AGC AAC CTC AGA CAC CA (SEQ ID NO:16) |
| P (β31, IVS1) 1 | CAC CCT TAG GCT GCT GG (SEQ ID NO:17 ) |
| P (IVS1) 2 | CCC ACC CTG AGG CTG CT (SEQ ID NO: 18) |
| β (31) 2 | CCC TTA GGT GCT GGT GG (SEQ ID NO:19) |

| | |
|---|---|
| P (cap+1) 1 | ATT GCT TAC ATT TGC (SEQ ID NO:20 ) |
| P (cap+1) 2 | ATT GCT TCC ATT TGC (SEQ ID NO:21 ) |
| β (19) 1 | AAG GTG AAC GTG GAT (SEQ ID NO:22) |
| β (19) 2 | AAG GTG AGC GTG GAT (SEQ ID NO:23) |
| β (95+A) 1 | CTG TGA CAA GCT GCA (SEQ ID NO:24) |
| β (95+A) 2 | TGT GAC AAA GCT GCA (SEQ ID NO:25) |
| IVS (2-5) 1 | AGG GTG AGT CTA TGG (SEQ ID NO:26) |
| IVS (2-5) 2 | AGG GTG ACT CTA TGG (SEQ ID NO:27) |
| β (41-42) 1 | CAG AGG TTC TTT GAG T (SEQ ID NO:28) |
| β (41-42) 2 | CAG AGG TTG AGT CCT T (SEQ ID NO:29) |
| IVS (2-654) 1 | GTT AAG GCA ATA GCA (SEQ ID NO:30) |
| IVS (2-654) 2 | GTT AAG GTA ATA GCA (SEQ ID NO:31) |
| β (17) 1 | CTG TGG GGC AAG GTG AAC (SEQ ID NO:32) |
| β (17) 2 | CTG TGG GGC TAG GTG AAC (SEQ ID NO:33) |
| β (71-72) 1 | TGC CTT TAG TGA TGG (SEQ ID NO:34) |
| β (71-72) 2 | TGC CTT TAA GTG ATG (SEQ ID NO:35) |
| β (71-72) 3 | TGC CTT TTA GTG ATG (SEQ ID NO:36) |
| IVS (1-5) 1 | CAG GTT GGT ATC AAG (SEQ ID NO:37) |
| IVS (1-5) 2 | CAG GTT GCT ATC AAG (SEQ ID NO:38) |
| IVS (1-1) 1 | TGG GCA GGT TGG TAT (SEQ ID NO:39) |
| IVS (1-1) 2 | TGG GCA GTT TGG TAT (SEQ ID NO:40) |
| β (30) 2 | CTG GGC GGG TTG GTA (SEQ ID NO:41) |

| | |
|---|---|
| P (-28) 1 | GGG CAT AAG AGT CAG (SEQ ID NO:42) |
| P (-28) 2 | GGG CAT AGG AGT CAG (SEQ ID NO:43) |
| P (-29) 2 | TGG GCA TGG AAG TCA (SEQ ID NO:44) |
| P (-30) 1 | CTG GGC ATA AAA GTC (SEQ ID NO:45) |
| P (-30) 2 | CTG GGC ACA AAA GTC (SEQ ID NO:46) |
| P (-31) 2 | GCT GGG CGT AAA AGT (SEQ ID NO:47) |
| P (-32) 2 | GGC TGG GAA TAA AAG (SEQ ID NO:48) |
| β (14-15) 1 | TAC TGC CCT GTG GGG CAA GG (SEQ ID NO:49) |
| β (14-15) 2 | TAC TGC CCT GGT GGG GCA AG (SEQ ID NO:50) |
| HbE (26) 1 | TGG TGG TGA GGC CCT (SEQ ID NO:51) |
| HbE (26) 2 | TGG TGG TAA GGC CCT (SEQ ID NO:52) |

wherein the DNA probes for α-thalassemia, HbH, HbS and HbM hemoglobin abnormality Constant Spring mutation comprise:

| | |
|---|---|
| P(cs) 1 | ATA CCG TTA AGG TGG (SEQ ID NO:53) |
| P (cs) 2 | ATA CCG TCA AGC TGG (SEQ ID NO:54) |

wherein the DNA probes for Quong SZE mutation comprise:

| | |
|---|---|
| P (qs) 1 | GCC TCC CTG GAC AAG (SEQ ID NO:55) |
| P (qs) 2 | GCC TCC CCG GAC AAG (SEQ ID NO:56) |

wherein the DNA probes for HbS sickle cell anemia mutation comprise:

| | |
|---|---|
| P (hbs) 1 | ACT CCT GAG GAG AAG (SEQ ID NO:57) |
| P (hbs) 2 | ACT CCT GTG GAG AAG (SEQ ID NO:58) |

wherein the DNA probes for Duan mutation comprise:

| | |
|---|---|
| P (duan)1 | GTG GAC GAC ATG CCC (SEQ ID NO:59) |

| | |
|---|---|
| P (duan)2 | GTG GAC GCC ATG CCC (SEQ ID NO:60) |

and wherein the DNA probes for HbM mutation comprise:

| | |
|---|---|
| P (hbm) 1 | TAA GGG CCA CGG CAA (SEQ ID NO:61) |
| P (hbm) 2 | TAA GGG CTA CGG CAA (SEQ ID NO:62) |
| P (hbm) 3 | CGA CCT GCA CGC GCA (SEQ ID NO:63) |
| P (hbm) 4 | CGA CCT GTA CGC GCA (SEQ ID NO:64) |
| P (hbm) 5 | AAG AAA GTG CTC GGT (SEQ ID NO:65) |
| P (hbm) 6 | AAG AAA GAG CTC GGT (SEQ ID NO:66) |
| P (hbm) 7 | TGA GCT GCA CTG TGA (SEQ ID NO:67) |
| P (hbm) 8 | TGA GCT GTA CTG TGA (SEQ ID NO:68) |
| P (hbm) 9 | GAA GGC TCA TGG CAA (SEQ ID NO:69) |
| P (hbm) 10 | GAA GGC TTA TGG CAA (SEQ ID NO:70) |

2. (new) A DNA chip for diagnosing the mutation of the hereditary anemia related genes having thereon fixed specific DNA probes for testing the above-said mutation on the glass slide, silica plate, membrane and macromolecular materials.

3. (new) The DNA chip of claim 2 wherein the fixed specific DNA probes are selected from the group consisting of

DNA probes for β-thalassemia;

DNA probes for α-thalassemia, HbH, HbS and HbM hemoglobin abnormality Constant Spring mutation;

DNA probes for Quong SZE mutation;

DNA probes for HbS Sickel Cell Anemia mutation;

DNA probes fro Duan mutaion;

DNA probes for HbM mutation, and

combinations thereof.